

DNA

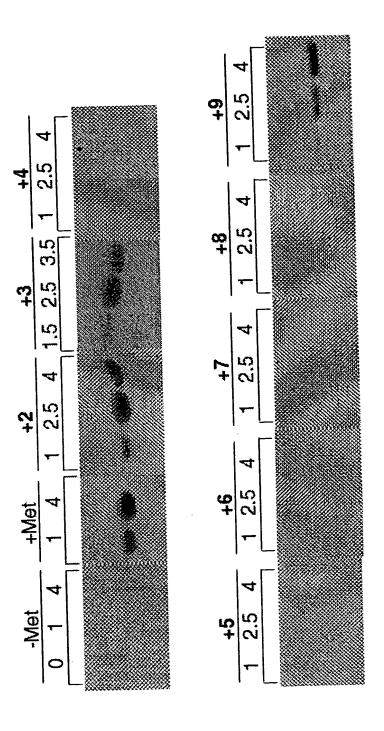
ACID ANALOGUES
Application No.: Unassigned Filing Date: July 1, 2003
Docket No.: CIT1460-2

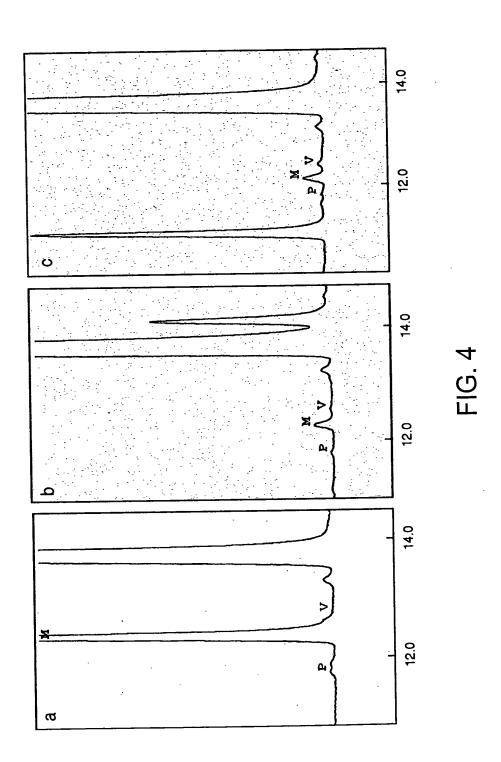
2/28

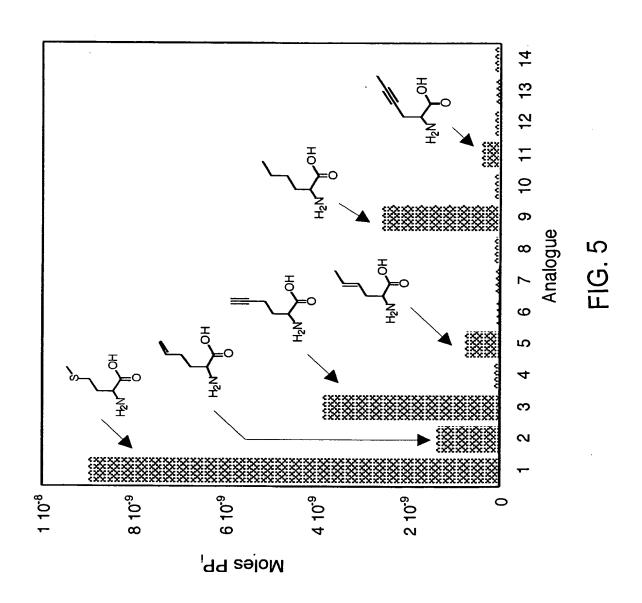
- 1. Methionine
- 2. Homoallylglycine
- 3. Homopropargylglycine
- 4. Cis-crotylglycine
- 5. Trans-crotylglycine
- 6. 6,6,6-trifluoro-2-amino hexanoic acid
- 7. 2-amino heptanoic acid
- 8. Norvaline
- 9. Norleucine
- 10. o-allylserine
- 11. 2-butynylglycine
- 12. Allylglycine
- 13. Propargylglycine

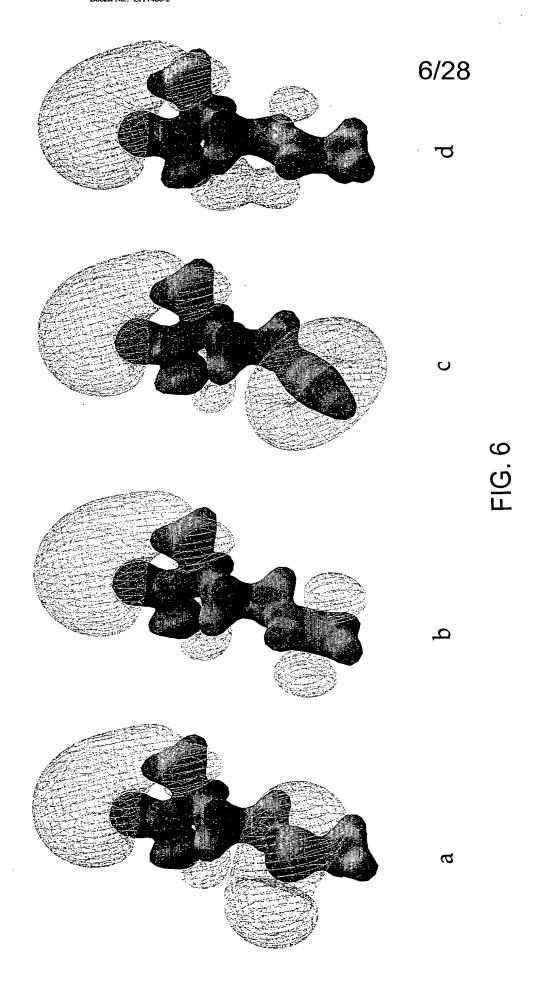
FIG. 2

3/28

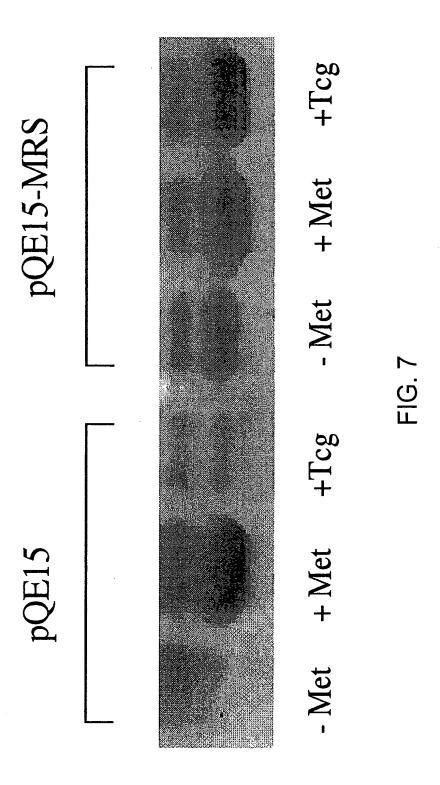


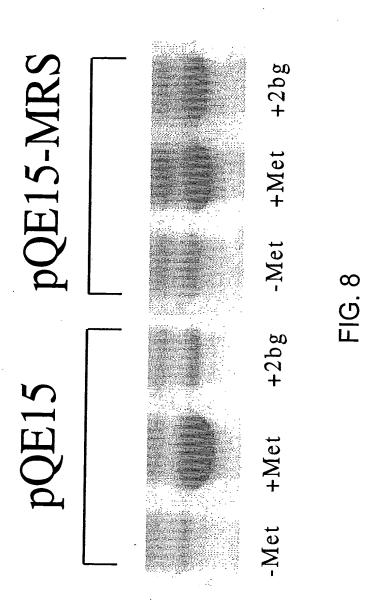


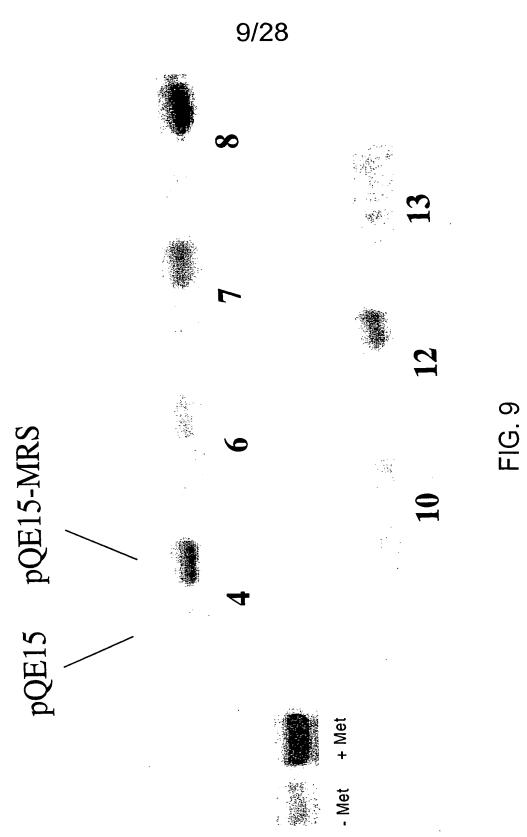




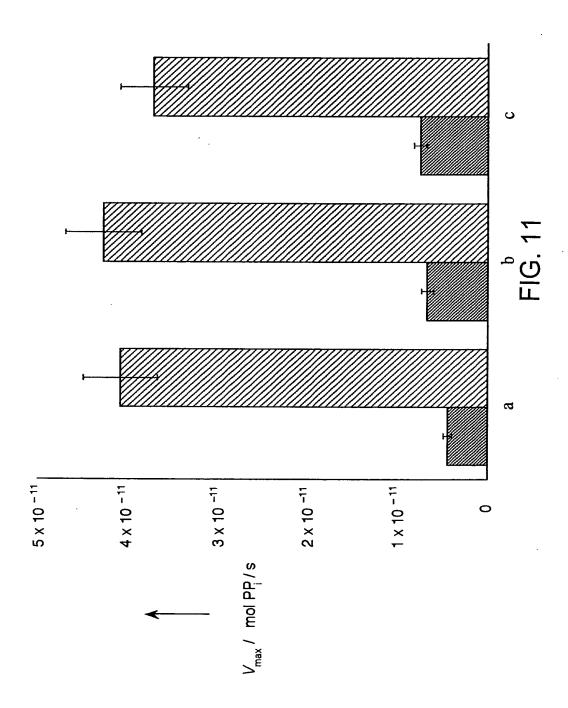
7/28

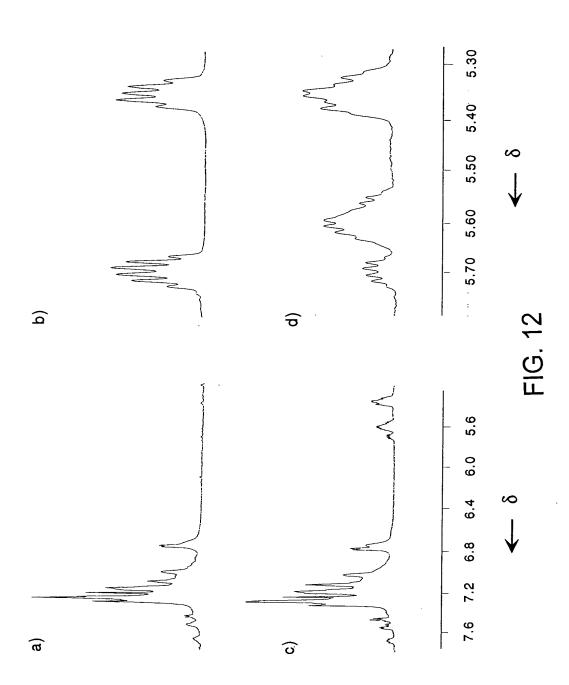




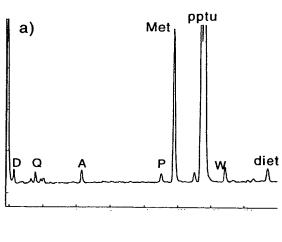


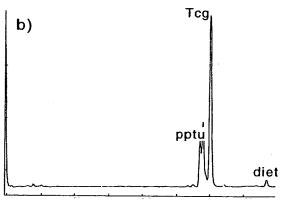
										ı
Incorporated by conventional host?	¥	¥	¥	X	X	z	Z	Z	Z	Z
Relative Value	1	1/390	1 / 500	1 / 1050	1 / 1850	1 / 4700	1/13825	1/46100	1/171000	1/456000
k_{cat}/K_m $(s^{-1}\mu M^{-1})$	5.47 x 10 ⁻¹	1.4×10^{-3}	1.08 x 10 ⁻³	5.22 x 10 ⁴	2.96 x 10 ⁴	1.16×10^4	3.9 x 10 ⁻⁵	1.2 x 10 ⁻⁵	3.2 x 10 ⁻⁶	.1.2 x 10 ⁻⁶
n)	ر م		,z	_	/	<u>ال</u>		لم -	7	
Analogue (Side chain shown)	Met	Aha	Hpg	Norl	Hag	Tcg	2bg	Norv	Ccg	Ag











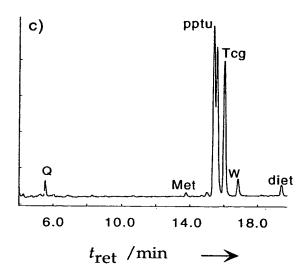
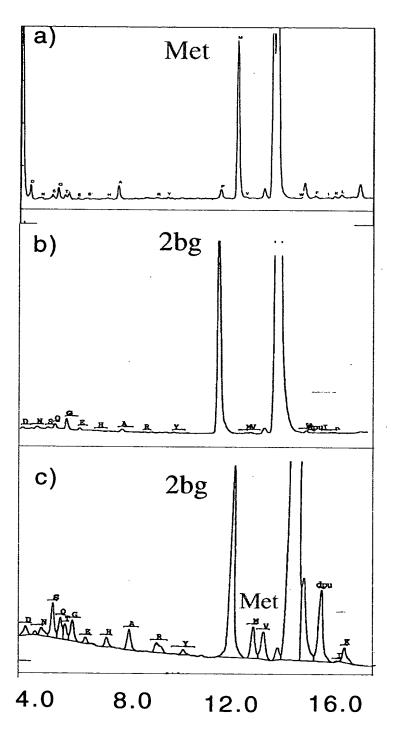


FIG. 13

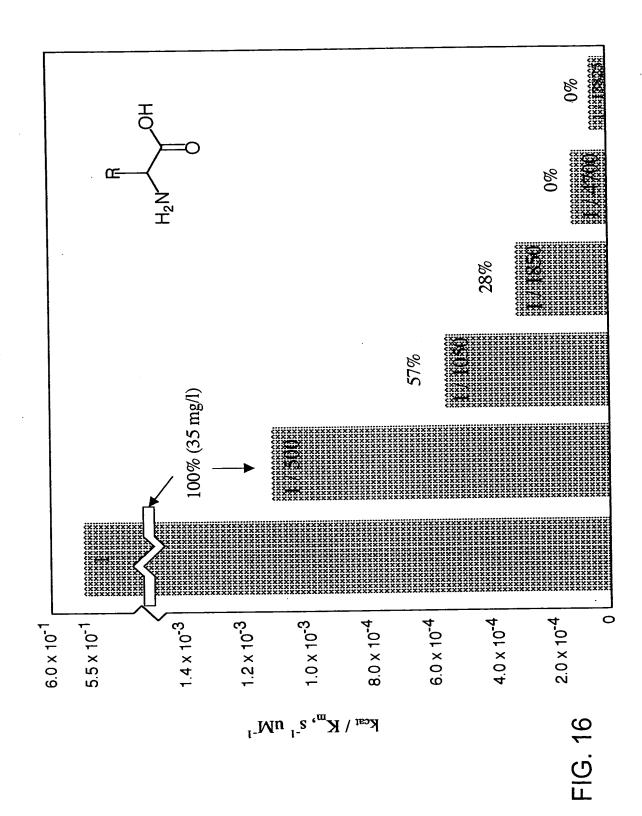


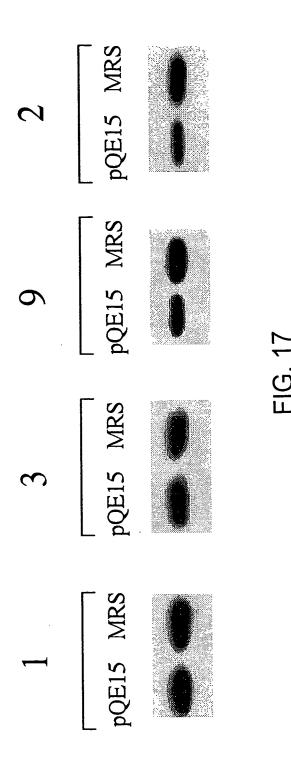
Retention time, minutes

FIG. 14

_			
4	_	$I \cap$	\mathbf{a}
	~	, ,	×
1	. J.	.	()

Analogue	K_{m} (μM)	$k_{cat}(s^{-1})$	$k_{cat}/K_m \left(s^{\text{-}1} \mu M^{\text{-}1}\right)$	Protein Yield, mg/L	
1	24.3 ± 2	13.3 ± 0.2	5.47x10 ⁻¹	35	
က	2415 ± 170	2.60 ± 0.3	1.08×10^{-3}	35	
6	4120 ± 900	2.15 ± 0.6	5.22x10 ⁻⁴	20	15/
7	4555 ± 200	1.35 ± 0.1	2.96x10 ⁻⁴	10	28
w	$15,675 \pm 250$	1.82 ± 0.6	$1.16x10^{-4}$	0	
					ı





18/28

 $aa \sim tRNA^{aa} + AMP + AARS$ $[AARS:aa\sim AMP] + PP_i$ AARS + aa + ATP $[AARS:aa\sim AMP] + tRNA^{aa}$

Q

a

CATAAAAAT TTATTTGCTT TGTGAGCGGA TAACAATTAT
T.T.Y.T.T.T.CCT.T.
GATAACAATT ICACACAGAA ITCATTAAA Aggaatgagga itgaggaatg
GGGGATTGGC
TCAAGTACTT CCAAAGAATG ACCACAACCT
TTATGGGTAG GAAAACCTGG TTCTCCATT
TTAATATAGT TCTCAGTAGA GAACTCAAAG
AAAGTTTGGA TGATGCCTTA AGACTTATT
TGGTTTGGAT AGTCGGAGGC AGTTCTGTT
TTAGACTCTT TGTGACAAGG ATCATGCAGG
TGATTTGGG GAAATATAAA CTTCTCCCAG
AGGAAAAAGG CATCAAGTAT AAGTTTGAAG
GCTTAATTAG CTGAGCTTGG ACTCCTGTTG
CTGGATTTGT TCAGAACGCT CGGTTGCCGC
TAGCTCTAGA GACGTCCGGC CGGAGCTCCA
CTTAACATTT TCCCATTTGG TACTATCTAA
CTATGACTCA AGTCGCGAAG AAAATTCTGG
CAATCCACCT CGGCCATATG CTGGAGCACA
GAATGCGCGG CCACGAGGTC AACTTCATCT
TGCTGAAAGC TCAGCAGCTT GGTATCACCC
AGCATCAGAC IGAITICGCA GGCTITAACA
GCGAAGAAA CCGCCAGTTG TCAGAACTTA
TTAAAAACCG CACCATCTCT CAGCTGTACG
GTTTTGTGAA AGGCACCTGC CCGAAATGTA
AAGICIGCGG CGCGACCIAC AGCCCGACIG
GCGCTACGCC GGTAATGCGT GATTCTGAAC

TCTTTCAGCG	AAATGTTGCA	GGCATGGACC	CGCAGCGGTG	CGTTGCAGGA	GCAGGTGGCA	1620
AATAAAATGC	AGGAGTGGTT	TGAATCTGGC	CTGCAACAGT	GGGATATCTC	CCGCGACGCC	1680
CCTTACTTCG	GTTTTGAAAT	TCCGAACGCG	CCGGGCAAAT	ATTTCTACGT	CTGGCTGGAC	1740
GCACCGATTG	GCTACATGGG	TTCTTTCAAG	AATCTGTGCG	ACAAGCGCGG	CGACAGCGTA	1800
AGCTTCGATG	AATACTGGAA	GAAAGACTCC	ACCGCCGAGC	TGTACCACTT	CATCGGTAAA	1860
GATATTGTTT	ACTTCCACAG	CCTGTTCTGG	CCTGCCATGC	TGGAAGGCAG	CAACTTCCGC	1920
AAGCCGTCCA	ACCTGTTTGT	TCATGGCTAT	GTGACGGTGA	ACGGCGCAAA	GATGTCCAAG	1980
TCTCGCGGCA	CCTTTATTAA	AGCCAGCACC	TGGCTGAATC	ATTTTGACGC	AGACAGCCTG	2040
CGTTACTACT	ACACTGCGAA	ACTCTCTTCG	CGCATTGATG	ATATCGATCT	CAACCTGGAA	2100
GATTTCGTTC	AGCGTGTGAA	TGCCGATATC	GTTAACAAAG	TGGTTAACCT	GGCCICCCGI	2160
AATGCGGGCT	TTATCAACAA	GCGTTTTGAC	GGCGTGCTGG	CAAGCGAACT	GGCTGACCCG	2220
CAGTTGTACA	AAACCTTCAC	TGATGCCGCT	GAAGTGATTG	GTGAAGCGTG	GGAAAGCCGT	2280
GAATTTGGTA	AAGCCGTGCG	CGAAATCATG	GCGCTGGCTG	ATCTGGCTAA	CCGCTATGTC	2340
GATGAACAGG	CICCGIGGGI	GGTGGCGAAA	CAGGAAGGCC	GCGATGCCGA	CCTGCAGGCA	2400
ATTTGCTCAA	TGGGCATCAA	CCTGTTCCGC	GTGCTGATGA	CTTACCTGAA	GCCGGTACTG	46
CCGAAACTGA	CCGAGCGTGC	AGAAGCATTC	CTCAATACGG	AACTGACCTG	GGATGGTATC	2520
CAGCAACCGC	TGCTGGGCCA	CAAAGTGAAT	CCGTTCAAGG	CGCTGTATAA	CCGCATCGAT	∞
ATGAGGCAGG	TTGAAGCACT	GGTGGAAGCC	TCTAAATGAG	AAGTAAAAGC	CGCTGCCGCG	2640
CCGGTAACTG	GCCCGCTGGC	AGATGATCCG	ATTCAGGAAA	CCATCACCTT	TGACGACTTC	0
GCTAAAGTTG	ACCIGCGCGI	GGCGCTGATT	GAAAACGCAG	AGTTTGTTGA	AGGTTCTGAC	
AAACTGCTGC	GCCTGACGCT	GGATCTCGGC	GGTGAAAAAC	GCAATGTCTT	CTCCGGTATT	2820
CGTICIGCIT	ACCCGGATCC	GCAGGCACTG	ATTGGTCGTC	ACACCATTAT	GGTGGCTAAC	∞
CIGGCACCAC	GTAAAATGCG	CTTCGGTATC	TCTGAAGGCA	TGGTGATGGC	TGCCGGTCCT	2940
GGCGGGAAAG	ATATTTTCCT	GCTAAGCCCG	GATGCCGGTG	CTAAACCGGG	TCATCAGGTG	3000
AAATAATCCC	CCTTCAAGGC	GCTGCATCGA	CAGCCTTTTG	CTTTATAAAT	TCCTAAAGTT	3060
GITITICLIGC	GATTTTGTCT	CTCTCTAACC	CGCATAAATA	CTGGTAGCAT	CTGCATTCAA	3120

21/28

•		4 14	\$ \$ £.	AAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA	AAAGCG TGGCG ACCGTT	AAAGCGC TGGCGZ ACCGTTC	AAAGCGG TGGCGA TCGTTG AAATGTA AAAAATA	AAAGCGG TGGCGAC TGGCGTTGI AAAATGTAC AAAAATAI	AAAGCGGAGTGGAGGCGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGGAGG	AAAGUTG AAAGCGGG ACGTTGA AAAAATAA AACCGGA ACCTGGTTA	GAAAAGITG AAAAGCGGGG CTTGGCGGGG CACCGTTGA GAAAAATAA TCATCCGGA CCCTTGTTA CCCTTGTTA CCGACGACGA	GAAAAGTTGG AAAAGCGGAG CTTGGCGAGG CACCGTTGAT TCATCCGGAZ CCCTTGTTAC CCACGACGAZ CCACGACGAZ AAACCTGGCC	GAAAAGITGG AAAAGCGGAG CTTGGCGAGG CACCGITGAG GAAAAAIAAG CCCTTGTTAC CCCTGGAGI CGTTTTCACC	AAAGTTGG AAAGCGGAGP TGGCGAGP AAAAATAAG AACTGGAP CTTGTTAC AACGAGGAT AACTGGCC AGGTGAGT	AAAGIIGG AAAGCGGAG TGGCGAGAAAAAAAG AAAAATAAG AACGAGGAA AACGAGGCC AACGAGGCC AAGGTTCACC AAGGTTCACC	AAAGITGG AAAGCGGAGA TGGCGAGA ACCGTTGATAC AAAAATAAG CTTGTTAC ACCTGGCC ACCTGGCC ACCTGGCC ACCTGCCT AACGCCTGCTACTACTGC AAAAGACTGCTGAAAAGACTG	GAAAGUTGG AAAAGCGGAGA CTTGGCGAGA CACCGTTGAT TCAATGTAAG GAAAAATAAG CCCTTGTTAC CCTTGTTAC TCAGGTTCAT TCAGGTTCAT CGAAACCCCT CGAAAGACTGC	AAAGITGG AAAGCGAGA TGGCGAGA AAAAATAAG AACGACGAT AACGACGAT TTTCACC AAGGTTCAT AAACGCCT AAACGCCT AAATCCGCC	AAAGTTGG AAAGCGAGA ACCGTTGAT AAAAATAAG AACCTGGAA ACCTGGCC AACCTGGCC AAACGCCTGC AAACGCCTGCC AAACGCCTGCCCTGC	AAAGIIGG AAAGGGAG TGGCGAGA AAAAATAAG AACGGGAA AACCTGGCC AGGTGAGT AACGTCGC AAAGGCTGC AAAGGCTGC AAAGGCTGC AAAGGCTGC	GARAGUTTGE AAAAGCGAGA CTTGGCGAGA CACCGTTGAT TCAATGTACC GAAAAATAAG CCACGACGAAA CCATTGTTAC CAAACCTGGCC TAAACGCCT TAAACGCCT CGAAAGACTGC CAAATCCGCC CCACGATAGC ACAAGCCT CCAAATCCGCC CCAAATCCGCCT CCAAATCCGCCT CCAAATCCGCCT AAACCCCTCATAGCCTCCCCT	GAAAGUTTGE AAAAGCGGAG CTTGGCGAGG CACCGTTGAT TCATCCGGAA CCCTTGTTAC CCACGACGAT CCACGGTGGCC CTGGGTGAGT CGTTTTCACC CAAACGCCT CGAAAGACCC CAAATCCGCC CCGTCAGGG GTAGCGATAG	GAAAAGITIGE AAAAGCTIGE AAAAGCGGAGA CTTGGCGTTGAT TCAATGTACC GAAAAAATAAG CCACGTTGAT CCACGACGAA CCCTTGTTAC CCACGACGAT CCACGACGAT CAAACCTGGCC CGAAACCTGCC CGAAACCTGCC CGAAACCTGCCT CGAAACCTGCCTGCCTGCCTGCCTGCCTGCCCTCCCCTC	GAAAGITGG AAAAGCTGGG CTTGGCGGGG CACCGTTGAT TCATCCGGAA CCCTTGTTAC CCACGGTGGC CTGGGTGACT CGTTTTCAC CGTTTTCAC CGTTTTCAC CGTTTTCAC CGTTTTCAT CCCGTCAGGG CAAAGCCCC ACTCCCT CCGTCAGGG GTAGCCCCAT GCGTCTTCC AGTGCACCCAT GCGTTTCCAC AGTGCACCCAT GCGTTTCCCCAT
	ATCAGTTGGC	ATCAGTTGGG G		•	•	•	•								,	,							0 0 0 0 0 0 0 0 0 0	$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
	CGAGTTGCAT	H (J	H U H	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT GAGGTATGGG	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT GATGTGGCGT TTTTTCGTCT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT ATGGACAACT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT GATGTGGCGT TTTTTCGTCT ATGGACAACT GTGCTGATGC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT ATGGACATCT ATGGACAACT ATGGACAACT ATGGACAACT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTCA GTGATATGGG TCATCGCTCT GATGTGGCGT TTTTTCGTCT GATGTGGCGT TTTTTCGTCT ATGGACAACT GAGGACAACT AAGGACAACT TTTTTCGTCT ATGGACAACT TAAGGCAGTT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTCA GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT ATGGACAACT ATGGACAACT ATGGACAACT ATGGACAACT ATGGACAACT ATGGACAACT ATGGACAACT ATGGACAACT ATGAATGCTTA	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTCA GTGATATGGG TCATCGCTCT GATGTGGCGT TTTTTCGTCT ATGGACAACT ATGGACAACT ATGATATGGC AGAATGCTTA TAAGGCAGTT AAGAAAACGA GAACGCTCTC GAACGCTCTC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTCA GAGGCATTTCA GTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT ATGGACAACT ATGGACAACT ATGACGAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT TAAGGCAGTT TAAGGCAGTT AAGGCAGTT AAGGCAGTT AAGGCAGTT TAAGGCAGTT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGCATTTCA GAGCATTTCA GTGATATGGG TCATCGCCC GTGATATGGG TCATCGCTCT GAGCACTTT AAGGACAACT AAGAATGCTTA TAAGGCAGTT AAGAATGCTTA TAAGGCAGTT AAGACCACT GGACCCCC AGAATGCTTA TAAGGCAGTT AAGACCACT GGACCCCCC GGACCCCCC AGAATGCTTA TAAGGCAGTT AATAAAAACGA GGACCCCCCC TGACCCTCTC TGACGGTGAA GGACCCCCCC CCGACCCCCCC CCGACCCCCCCC CCGACCCCCCCC	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT GATGCACTT AAGGCAGTT CGAGCCGGG	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT GAGGACACT AAGGACAACT AAGGACAACT GAACGATGC AGAATGCTTA TAAGGCCATCT TGACGGTGAA GGACGCTCTC TGACGCTCTC TGACGCTCTC TGACGCTCTC TGACGCTCTC TGACGCTCTC TCAGAGCCATG TCAGAGCCATG TCAGAGCCATG	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTC GCCTTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT TTTTTCGTCT ATTTTCGTCT ATTAAAAACGA TAAGGCAGTT AAGGCAGTT AATAAAAACGA GGATGCCGGG CGCAGCAGT TCAGAGCAGA AGGAGCAGA AGGAGAAATT	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAATCA GAGGCATTTCA GAGGCATTTCA GTGATATGGG TCATCGCTCT GATGTGCCGC AGAATGCTTA AATAAAACGA GAACGCTCT AAGGCCATTC TGACGGTGAA GGATGCCGGG CGCAGCCATG TCAGAGCAGTT AAGGCCATCC TGACGGTGAA GGATGCCGGG CGCAGCCATG TCAGAGCAAAT GGATGCCGGG CGCAGCCATG TCAGAGCAAAAT GGATGCCGGG	CGAGTTGCAT TCAGATGCTG CCGGACGTCT AAAAAAATCA GAGGCATTTCA GACGTTTTAA CTTGCCCGCC GTGATATGGG TCATCGCTCT ATTTTCGTCT ATTTTCGTCT ATTTTCGTCT ATTTTCGTCT AGAATGCTTA AATAAAACGA GAACGCTCTC TGACGCGGG CGCAGCTCT AAGGCCAGTT AAGGCCAGTT AAGGCCAGT AATAAAAACGA GAACGCTCTC TGACGCTCTC TGACGCTCTC TGACGCTCTC GAACGCTCTC GAACGCTCTC TGACGCTCTC TCAGAGCAAAT CGCTTCTCTCCCC GAATCCGCC GAATCCGCC CGCAGCCACC TCACCCCTCC TCACCCCCCCC
AACAGGGAAA		AAAAAGTTTT	AAAAAGTTTT CGGTACCCGG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG	AAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT	AAAAAGTTTT CGGTACCCGG TAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG CGTGGCCAAT	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAGAATATG CGTGGCCAAT AGGCGACAAG CGTGGCCAAT AGGCGACAAG CGTGGCCAAT	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGCC GTAATTTTTT TGAGGCATCA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA GTATTTTTTTTTT	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA GTTTGTCGGT GTTTCGGTGA GTTTCGGTGA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCGCAA TGAGAATATG CGTGGCCAAT AGCCAATT AGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA GTTTCGGTGA GTTTCGGTGA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT AGGCGACAA TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TATTCACATT CGGTGAGCTG TGAAACGTTT ATATTCACAAT ACATATTCGCAA TGAGAATATT AGAGACAAC GTAATTTTTT TGAGCATCGC GTAATTTTTT TGAGCCATCA GTTTCGGTGA	AAAAAGTTTT CGGTACCCGG TAAAATGGAG AGAACATTTT GGATATTACG TATTCACATT CGGTGAGCTG TGAAACGTTT AGGCGACAA TGAGAATATG CGTGGCCAAT AGGCGACAAG CCATGTCGGC GTAATTTTTT TGAGGCATCA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTGTCGGTGA GTTTTGTCGGTGA GTTTTGTCGGTGA GTTTTGTCGGTGA GTTTTGTCGGTGA GTTTTGTCGGTGA GTTTTGTCGGTGA
GCAGTTGAGC		AAAGCCAGAT	AAGCCAGAT GGGGGGGCC	AAGCCAGAT GGGGGGGCC TAAGGAAGC	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT AGGGTTTAT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT TCGGCCTT TCGGCCAAC TCTACACAT TGATTTAAA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT AGGGTTTAT TGATTTAAA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT TCTACACAT TGAGCAAAC TCTACACAT TGATTTAAA TGATTTAAA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT TGATGACAAC TCTACACAT GGGCGGGCC	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT TCTACACAT TGATGAAAGA TGATGAAACA TGATGCAAAC TGATGCAAAC TGATGCAAAC	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT AGGGTTTAT TGATGGCTT GGGCGGGGC TCTCTAGCT TGATGGCTT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT TGATTTAAA TGATTTAAA TGATTTAAA TGATTTAAA TGATTTAAA TGATTTAAA TGATTTAAA	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGATGAAAGA TGATTTAAA TTATACGCA TGATTTAAA TTATACGCA TGATTTAAA TTATACGCA TGATTTAAA TTATACGCA TGATTTAAA TGATTGCAAC TCACAGCTT GGCCGGGGC TCTCTAGCT TCTCTAGCCT TCTCTAGCT TCTCT	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT TGATTTAAA TTATACGCA TGATGGGGC TCTCTAGCT TGATGGGGC TCTCTAGCT TGATGGCT TGATGGCT TGATGGCT TGATGGCT TGATGGCC TCTCTAGCT T	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGATGAAAC TCTACACAT TGATTAAA TTATACGCA TCTACGCCTT GGGCTTTAT TGATCGCTT GGGCGGGC TCTCTAGCT TTATACGCA TGATGGCTT GGCTCGCGC TCTCTAGCT TTATCTGTT GGCCGGGC TCTCTAGCT TTATCTGTT GGCCGGGC TCTCTAGCT TTATCTGTT GGCCGGGC TCTCTAGCT TTATCTGTT GGCCGGGC TCTCTAGCT TTATCTGTT GCCTCGCGC TCTCTAGCT TTATCTGTT GTGTTGGCG TCACGCGC TCACGCGC TCACCGCC TCACCGCC TCACCGCC TCACCGCC TCACCGCC TCACCGCC TCACCGCC TCACCGCCC TCACCCCCC TCACCCCCCC TCACCCCCCCC TCACCCCCCCC	AAGCCAGAT GGGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCCGGCCTT AATGAAAGA TGAGCAAAC TCTACACAT TGATTTAAA TGATTTAAA TTATACGCA TCTCTAGCTT GGGCGGGGC TCTCTAGCTT TGATGGCTT TGATGGCTT TGATGGCTT TGATGGCGC TCTCTAGCT TCTC	AAGCCAGAT GGGGGGCC TAAGGAAGC GCATCGTAA CGTTCAGCT TCTACACAT TGATTTAAA TGATTTAAA TTATACGCC TCTACGCCTT TGATCTGTT GGGCGGGC TCTCTACGCT TGATGCCTT GGGCTTTAT GGGCTTTAT GGGCTTTAT GGGCTTTAT GGGCTTTAT GGGCTTAGCT TTATACGCA TCACAGCTT GGGCTTAGC TCACAGCTT GGGCTTAAA AATACCGCA GATACCGCA GGTTGGCC GGCTTAAA
TAAATTCAGG		\mathbf{c}	ပပ																					

FIG. 19-3

6501				ت ت	TICGICTICA C	ACGAGGCCCT
6480	TAGGCGTATC	CCTATAAAAA	ATGACATTAA	CATTATTATC	TCTAAGAAAC CATTATTATC ATGACATTAA CCTATAAAAA TAGGCGTATC 6480	CCACCTGACG
6420	CCGAAAAGTG	GCACATTTCC	GGGGTTCCGC	TITAGAAAAA TAAACAAATA GGGGTTCCGC GCACATTTCC CCGAAAAGTG 6420		TTTGAATGTA
6360	CGGATACATA	GTCTCATGAG	CAGGGTTATT	AATATTATTG AAGCATTTAT CAGGGTTATT GTCTCATGAG CGGATACATA 6360	AATATTATTG	TICCITITIC
6300	ACT CAT ACT C	AATGIIGAAT	GCGACACGGA	GGGAATAAGG	CCGCAAAAAA GGGAATAAGG GCGACACGGA AATGTTGAAT ACTCATACTC 6300	AGGCAAAATG

	120	240	300	360	420	480	540	009	099	720	780	840	006	096	1020	1080	1140	1200	1260	1320	1380	1440	1500	1560
AATAGATTCA	AACTATGAGA	GCCTCCGCTC	AGGTAAACAG	TCGACCTTTA	AGGAGCTCAT	ATTGGCAAGT	CATGAATCAA	TGACACGTTT	CGICCICICI	GAAAGGTTGG	TAATGACCTC	TTATTGGTGA	GGCCGCTCTA	CTATTAAGAA	ACTGCCGTAC	TGICIGGGIC	TGCCCACGGT	GATTGGCGAA	CAACTATCAC	CCTGAAAGAA	AGGCATGTTC	TCAATACGGC	GCCGAAATCG	TGATCTGCCC
TAACAATTAT	AGGAGAAATT	ACCTACCCTG	CTTCAGTGGA	CTGAGAAGAA	AACCACCACG	AACAACCGGA	ACCAGGAAGC	AATTTGAAAG	AATACCCAGG	TCTACGAGAA	ATAGATCCAG	CGGGCGTTTT	CCCCCCTCCC	CCCCTTTTCA	TGACGTGCGC	TCCAGGCTGA	GCGCCGACGA	CGGAGCAGAT	TCAGCTATGA	TCTACTCTCG	ATCCGGAAAA	AATCCCCGGA	AACTGATCGA	ACTTCTTCTT
TGTGAGCGGA	TTCATTAAAG	AAGAACGGAG	ACCACAACCT	TTCTCCATTC	GAACTCAAAG	AGACTTATTG	AGTICIGITI	ATCATGCAGG	CTTCTCCCAG	AAGTTTGAAG	ACTCCTGTTG	CGGTTGCCGC	CGGAGCTCCA	TACTATCTAA	AAAATTCTGG	CTGGAGCACA	AACTTCATCT	GGTATCACCC	GGCTTTAACA	TCAGAACTTA	CAGCTGTACG	CCGAAATGTA	AGCCCGACTG	GATTCTGAAC
	TCACACAGAA	GGGGATTGGC	CCAAAGAATG	GAAAACCTGG	TCTCAGTAGA	TGATGCCTTA	AGTCGGAGGC	TGTGACAAGG	GAAATATAAA	CATCAAGTAT	CTGAGCTTGG	TCAGAACGCT	GACGTCCGGC	TCCCATTTGG	AGTCGCGAAG	CGGCCATATG	CCACGAGGTC	TCAGCAGCTT	TGATTTCGCA	CCGCCAGTTG	CACCATCTCT	AGGCACCTGC	CGCGACCTAC	GGTAATGCGT
CATAAAAAT	GATAACAATT	CCCAAAATAT	TCAAGTACTT	TTATGGGTAG	TTAATATAGT	AAAGTTTGGA	TGGTTTGGAT	TTAGACTCTT	TTGATTTGGG	AGGAAAAAGG	GCTTAATTAG	CTGGATTTGT	TAGCTCTAGA	CTTAACATTT	CTATGACTCA	CAATCCACCT	GAATGCGCGG	TGCTGAAAGC	AGCATCAGAC	GCGAAGAGAA	TTAAAAACCG	GTTTTGTGAA	AAGTCTGCGG	GCGCTACGCC
CTCGAGAAAT	ATTGTGAGCG	GTCGCCGTGT	AGGAACGAGT	AATCTGGTGA	AAGGACAGAA	TTTCTTGCCA	AAAGTAGACA	CCAGGCCACC	TTCCCAGAAA	GAGGTCCAGG	AAGATCTTAA	AGAACTCCAT	GAATCCAAGC	GAGTCACTTA	GTAATGCCTA	GCTAACGGCT	CGTTACCAGC	ACACCGATCA	ATGAGTCAGG	TCGACGCACA	AACGGTTTTA	CTGCCGGACC	GATAACTGCG	GTGGTTTCTG

CTGGATAAAA TAAATTCAGG	TTACAGGGAT GCAGTTGAGC	GCAGAATGAG AACAGGGAAA	ACACTTTATC CGAGTTGCAT	TATCAGGACG ATCAGTTGGG	AAAAATCACA GAAAAGTTGG	3180 3240
CACCAAAGGC	AAAGCCAGAT	AAAAAGTTTT	TCAGATGCTG	CGGCAGCGGC	AAAAGCGGAG	3300
CCCGACCTCG	AGGGGGGCC	CGGTACCCGG	CCGGACGTCT	CTAGAGCTAG	CTTGGCGAGA	3360
TTTCAGGAG	CTAAGGAAGC	TAAAATGGAG	AAAAAATCA	CTGGATATAC	CACCGTTGAT	3420
ATATCCCAAT	GGCATCGTAA	AGAACATTTT	GAGGCATTTC	AGTCAGTTGC	TCAATGTACC	3480
TATAACCAGA	CCGTTCAGCT	GGATATTACG	GCCTTTTTAA	AGACCGTAAA	GAAAAATAAG	3540
CACAAGTTTT	ATCCGGCCTT	TATTCACATT	CIIGCCCCC	TGATGAATGC	TCATCCGGAA	3600
TTTCGTATGG	CAATGAAAGA	CGGTGAGCTG	GTGATATGGG	ATAGTGȚICA	CCCTTGTTAC	3660
ACCGTTTTCC	ATGAGCAAAC	TGAAACGTTT	TCATCGCTCT	GGAGTGAATA	CCACGACGAT	3720
TICCGGCAGT	TTCTACACAT	ATATTCGCAA	GATGTGGCGT	GTTACGGTGA	AAACCTGGCC	3780
TATTTCCCTA	AAGGGTTTAT	TGAGAATATG	TITITCGICI	CAGCCAATCC	CTGGGTGAGT	3840
TTCACCAGTT	TTGATTTAAA	CGTGGCCAAT	ATGGACAACT	TCTTCGCCCC	CGTTTTCACC	0
ATGGGCAAAT	ATTATACGCA	AGGCGACAAG	GTGCTGATGC	CGCTGGCGAT	TCAGGTTCAT	9
CATGCCGTCT	GIGAIGGCII	CCATGTCGGC	AGAATGCTTA	ATGAATTACA	ACAGTACTGC	4020
GATGAGTGGC	AGGGCGGGGC	GTAATTTTTT	TAAGGCAGTT	ATTGGTGCCC	TTAAACGCCT	4080
GGGGTAATGA	CTCTCTAGCT	TGAGGCATCA	AATAAAACGA	AAGGCTCAGT	CGAAAGACTG	4
GGCCTTTCGT	TTTATCTGTT	GTTTGTCGGT	GAACGCTCTC	CTGAGTAGGA	CAAATCCGCC	4200
GCTCTAGAGC	TGCCTCGCGC	GTTTCGGTGA	TGACGGTGAA	AACCTCTGAC	ACATGCAGCT	4260
CCCGGAGACG	GTCACAGCTT	GTCTGTAAGC	GGATGCCGGG	AGCAGACAAG	CCCGTCAGGG	4320
CGCGTCAGCG	GGTGTTGGCG	GGTGTCGGGG	CGCAGCCATG	ACCCAGTCAC	GTAGCGATAG	4380
CGGAGTGTAT	ACTGGCTTAA	CTATGCGGCA	TCAGAGCAGA	TIGIACIGAG	AGTGCACCAT	4440
ATGCGGTGTG	AAATACCGCA	CAGATGCGTA	AGGAGAAAAT	ACCGCATCAG	GCGCTCTTCC	4500
GCTTCCTCGC	TCACTGACTC	GCTGCGCTCG	GICIGICGGC	TGCGGCGAGC	GGTATCAGCT	4560
CACTCAAAGG	CGGTAATACG	GTTATCCACA	GAATCAGGGG	ATAACGCAGG	AAAGAACATG	4620
TGAGCAAAAG	GCCAGCAAAA	GGCCAGGAAC	CGTAAAAAGG	CCGCGTTGCT	GGCGTTTTTC	4680

CCCCCTGA
ATACCAGGC
TACCGGATA
CTGTAGGTA
CCCCGTTCA
AAGACACGA
TGTAGGCGGT
AGTATTTGGT
TIGATCCGGC
TACGCGCAGA
TCAGTGGAAC
CACCTAGATC
AACTTGGTCT
ATTTCGTTCA
CTTACCATCT
TTTATCAGCA
ATCCGCCTC
TAATAGTTTG
TGGTATGGCT
GTTGTGCAAA
CGCAGTGTTA
CGTAAGATG
GCGCCGACC
AACTTTAAAA
ACCGCTGTTG
TTTTACTTTC

6300	6360	6420	6480	6501
CCGCAAAAAA GGGAATAAGG GCGACACGGA AATGTTGAAT ACTCATACTC 6300	AATATTATTG AAGCATTTAT CAGGGTTATT GTCTCATGAG CGGATACATA 6360	TITAGAAAAA TAAACAAATA GGGGTTCCGC GCACATTTCC CCGAAAAGTG 6420	TCTAAGAAAC CATTATTATC ATGACATTAA CCTATAAAAA TAGGCGTATC 6480	
AATGTTGAAT	GTCTCATGAG	GCACATTTCC	CCTATAAAAA	
GCGACACGGA	CAGGGTTATT	GGGGTTCCGC	ATGACATTAA	
GGGAATAAGG	AAGCATTTAT	TAAACAAATA	CATTATTATC	ບ
CCGCAAAAAA	AATATTATTG	TTTAGAAAAA	TCTAAGAAAC	TICGICTICA C
AGGCAAAATG	TICCITITIC	TTTGAATGTA	CCACCTGACG	ACGAGGCCCT